



# Up with CFL Downlights

## The Problem

The use of downlights in the residential market is increasing, yet energy-efficient compact fluorescent lamp (CFL) downlights have not been widely accepted or adopted by residential builders and homeowners. That's because residential CFL downlights are costly, difficult to install, and not widely available. In addition, existing residential products are not as efficient or reliable as their commercial market cousins. As a result, builders often install inefficient incandescent lights, increasing electricity bills for consumers and adding to peak demand on electric utilities.

## The Solution

A low-cost, high-performance downlighting system has been developed for residential kitchens. Kitchen lighting is the largest lighting energy user in California homes, accounting for one-quarter of residential lighting operating costs. The Energy Star-rated Kitchen Lighting System (KLS) features two CFLs that can be controlled from a single ballast, uses fixtures that emit more than 50 lumens per watt, and costs less than half as much to install as current commercial-grade products. The KLS is now offered as a product by Lithonia Lighting (**Figure 1**). As an indication of a real market transformation in progress, other lighting manufacturers—including Cooper Lighting, Progress Lighting, and Seagull Lighting—have recently introduced similar products.

## Features and Benefits

The KLS incorporates a number of features that help it deliver high performance at low cost.

**Thermally enhanced ballast configuration.** The KLS ballast is connected to the main metallic housing for the downlight pan itself, helping to keep the ballast at acceptable operating tem-

Figure 1: KLS product

The Lithonia Lighting Kitchen Lighting System (KLS) product is now available.



Figure 2: Easy to install

Builders can install the Kitchen Lighting System the same way that they would a conventional downlight.



peratures and ensuring long lamp life—even when the fixture is buried under insulation or installed in a hot attic space.

**One-ballast, two-fixture design.** This approach reduces material and installation costs. The biggest material cost for CFL downlighting is the electronic ballast. The KLS replaces the two one-lamp ballasts used in a conventional approach with one two-lamp ballast. Because the costs of two-lamp and one-lamp ballasts are essentially the same, this is a significant advantage. Using a single ballast for multiple lamps also cuts the number of hard-wired connections in half, resulting in savings on installation labor.

**Institutionally transparent and builder-friendly.** Builders can install the KLS in a manner similar to a conventional downlight (**Figure 2**). After the first test installations at a series of homes in Sacramento Municipal Utility District (SMUD) territory, the installers reported that the KLS was easier to put in than conventional systems.

**Plug-and-play wire connections.** A flexible and removable connector design simplifies the wiring to the fixture and cuts installation cost.

**Improved maintenance.** Accessible ballasts, plug-and-play design, and an 11-foot-long wiring harness that allows easy connection with other fixtures make maintenance easier.

**High-performance optics.** The reflector optics for the KLS are based on existing commercial-grade CFL products that maximize output while minimizing glare.

**High-quality CFL.** The CFLs included with the KLS are 26-watt high-quality, high-output lamps.

**High-quality ballast.** The ballast chosen for the KLS is a rapid-start unit approved for residential applications (FCC Class B).

These features combine to make the KLS far more cost-effective than incandescent and CFL downlight alternatives (**Table 1**). The system cuts energy use by 75 percent with negligible cost increase compared to standard incandescent downlighting, all while providing higher, more-uniform illumination levels.

## Applications

The KLS was developed specifically for new residential kitchens, but the system can be installed in any other residential spaces where downlights are used. Its features are based on detailed analysis of current construction techniques and feedback from homebuilders. In addition, the system is appropriate for many different residential applications and can be used as a retrofit. The Public Interest Energy Research (PIER) program is also funding a project to optimize the design for the retrofit market.

## California Codes and Standards

In October 2005, California's Title 24 will require at least half of the installed wattage in a kitchen to be hard-wired high-efficiency sources and fixtures. This requirement will effectively eliminate the use of incandescent downlights and screw-base CFLs in kitchens. The KLS will help builders comply with this stringent standard.

Table 1: Performance of the KLS

Compared to standard compact fluorescent lamp (CFL) downlighting products, the Kitchen Lighting System (KLS) provides more light at significantly lower installed cost.

	Standard incandescent lamp	Standard CFL	KLS
Number of downlights	10	10	6
Power per downlight (watts)	65	15	26
Total light output (lm)	6,080	3,900	7,800
Total power (watts)	650	150	180
Total installed cost (\$)	500	650	420
Operating cost (\$/y)	76	18	21
Cost increment (\$)	NA	150	-80
Savings (\$/y)	NA	58	55
Simple payback (y)	NA	2.6	Immediate

## What's Next

California electric utilities will likely play a significant role in the commercialization of the KLS. SMUD has integrated the KLS into its Advantage Homes program, which encourages homebuilders to adopt energy-saving devices in new homes. A number of systems have been installed in SMUD territory, and the utility has signed agreements with the homebuilders to collect survey data from the eventual homeowners to determine their opinions of these systems. The utility is also providing \$10,000 to each of five home-building projects in its territory to implement the technology. Southern California Edison and Pacific Gas & Electric also plan to acquire KLS units for demonstration purposes. All California utilities will likely initiate incentive programs to prepare the homebuilders in their service territories for the coming changes to Title 24.

Dimming capabilities may also be added to the product design—a desirable feature, especially for higher-end homes where owners might be willing to pay a premium for it. Because the KLS uses a single ballast to operate two downlights, the cost of “upgrading” to dimming of the KLS would only be half that of standard one-ballast, one-downlight systems.

## Collaborators

The organizations involved in this project include California Lighting Technology Center, Lawrence Berkeley National Laboratory, Lithonia Lighting, and the Sacramento Municipal Utility District.

## For More Information

Reports documenting this project and providing more details may be downloaded at [www.energy.ca.gov/pier/buildings/projects/500-98-020-0.html](http://www.energy.ca.gov/pier/buildings/projects/500-98-020-0.html).

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## About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) program. PIER supports public-interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

**For more information visit** [www.energy.ca.gov/pier](http://www.energy.ca.gov/pier)

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